

Code No: 126ED

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech III Year II Semester Examinations, May - 2016

DESIGN OF MACHINE MEMBERS - II

(Common to ME, AME)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (25 Marks)

- 1.a) Define static load carrying capacity of ball bearing. [2]
- b) State any two advantages and disadvantages of deep grooving ball bearing. [3]
- c) What are the basic functions of piston rings? [2]
- d) Under what forces the big end bolt and caps are designed. [3]
- e) What is the polygon action in roller chain? [2]
- f) What is the effect of centrifugal tension on power transmitted by a belt drive? [3]
- g) What is dynamic load? What are its causes? [2]
- h) What is the velocity factor for bevel gears? [3]
- i) What is self locking of power screw? [2]
- j) What is collar friction? [3]

PART - B (50 Marks)

2. Design a bearing and journal to support a load of 4500N at 600 rev/min using a hardened steel journal and a bronze backed Babbitt bearing. The bearing is lubricated by oil rings. Take room temperature as 21⁰C and the oil temperature as 80⁰C. [10]

OR

3. A ball bearing operates on the following work cycle:

Element No	Radial load (N)	Speed (R.P.M)	Element time (%)
1.	3000	720	30
2.	7000	1440	40
3.	5000	900	30

The dynamic load capacity of the bearing is 16600N. Calculate

- a) The average speed of rotation; b) The equivalent radial load c) the bearing life. [10]

4. Design a cast iron piston for a single acting four stroke engine for the following specifications:

Cylinder bore = 100mm, Stroke = 120mm, Maximum gas pressure = 5 N/mm²

Brake mean effective pressure = 0.65 N/mm², Fuel consumption = 0.227 kg/KW/hr

Speed = 2200 rev/min, Assume suitable data. [10]

OR

5. The following data refer to a 4-stroke cycle, single cylinder diesel engine
 Suction pressure = 0.095 MPa, Cylinder diameter = 200 mm, Stroke = 200 mm
 Ratio of compression = 15, Engine speed = 7450rpm, Equivalent mass of reciprocating parts 2 N/sq.mm of piston area, Ratio of connecting rod length to crank length is 4. Design Nickel steel connecting rod of I section choosing the suitable values for the permissible stresses for the material. [10]

26901 PSM

by a 15KW, 1750 r.p.m electric motor. The centre distance is twice the diameter of the large pulley, The density of the belt material =1500 kg/m³; maximum allowable stress=4MPa; $\mu_1=0.5$ (motor pulley) $\mu_2=0.4$ (blower pulley); peripheral velocity of the belt =20m/s. Determine the following:

- a) Pulley diameter; b) Belt length; c) Cross-sectional area of the belt; d) Minimum initial tension for operation without slip; and e) Resultant force on the plane of the blower with an initial tension 50 percent greater than the minimum value. [10]

OR

7. Select a wire rope for a vertical mine hoist to lift a load of 20 kN from a depth of 500 meters. A rope speed of 3 m/s is to be attained in 10 seconds. [10]

8. A compressor running at 300 rev/min is driven by a 15KW, 1200 rev/min motor through a $14\frac{1}{2}$ full depth spur gears. The centre distance is 0.375 m. the motor piston is to be of C-30 forged steel hardened and tempered, and the driven gear is to be cast steel. Assuming medium shock condition:

- a) Determine the module, the face width, and the number of teeth on each gear.
b) Check the gears for dynamic load and wear
c) Design the drive completely. [10]

OR

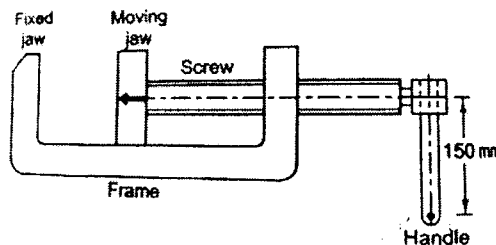
9. A helical cast steel gear with 30° helix angle has to transmit 35 kW at 2000 rpm. If the gear has 25 teeth, find the necessary module, pitch diameters and face width for 20° full-depth involute teeth. The static stress for cast steel may be taken as 100MPa. The face width may be taken as 3 times the normal pitch. The tooth form factor is given by expression $y = 0.154 - 0.912 / T_E$, where T_E represents the equivalent number of teeth. The velocity factor is given by $C_v = 6 / (6 + V)$ where V is the peripheral speed of the gear in m/s. [10]

10. A double square thread power screw with ISO metric trapezoidal threads, is used to raise load of 300kN. The nominal diameter is 100mm and the pitch is 12mm. The coefficient of friction at screw threads, is used to raise a load of 300kN. The nominal diameter is 100mm and the pitch is 12mm. The coefficient of friction at screw threads is 0.15. Neglecting collar friction, calculate

- a) Torque required raising the load
b) Torque required lowering the load and
c) The efficiency of the screw. [10]

OR

11. A machine vice, as shown in figure, has single start, square threads with 22mm nominal diameter and 5mm pitch. The outer and inner diameters of the friction collar are 55mm and 45mm respectively. The co-efficient of friction for thread and collar are 0.15 and 0.17 respectively. The machinist can comfortably exert a force of 125N on the handle at a mean radius of 150mm. Assuming uniform wear for the collar, Calculate: (a) The clamping force developed between the jaws. (b) The overall efficiency of the clamp. [5+5]



Figure